DOCUMENT RESUME

ED 310 171 TM 013 862

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TITLE The Effect of Age, Education, and Work Experience on General Aptitude Test Battery Validity and Test Scores. USES Test Research Report No. 50.
INSTITUTION Employment and Training Administration (DOL), Washington, D.C.
PUB DATE 87
NOTE 65p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Adults; *Age; *Aptitude Tests; Correlation; *Educational Attainment; Job Applicants; Meta Analysis; Occupational Tests; Predictor Variables; *Scores; *Test Validity; *Work Experience
IDENTIFIERS *General Aptitude Test Battery

ABSTRACT

Meta-analytic techniques were used to analyze the effects of age, education, and work experience on General Aptitude Test Battery (GATB) validities and test scores. The sample consisted of 30,568 subjects from 143 Specific Aptitude Test Battery (SATB) validation or revalidation studies analyzed since 1972. The effect of these three variables on GATB validities was investigated using the 24,219 sample members for whom the Standard Descriptive Rating Scale information was available. The sample was divided into intervals based on age, education, and work experience and the validities within the intervals were compared. Partial correlations were used to determine the effect of each variable on GATB validities. There were slightly more significant differences between validities for all jobs than would be expected by chance. Controlling for age somewhat increased validities. Education showed positive correlations with all nine GATB aptitudes, with the highest correlation for cognitive aptitudes and lower correlations for psychomotor aptitudes. Validities were higher for subjects with more than 12 years of education. When education was controlled for, validities decreased slightly. There were more differences in validities between experience levels than would be expected by chance, but the pattern was not consistent across the nine aptitudes. When experience was controlled for, validities increased slightly. Fourteen tables present data and nine graphs illustrate the text. An appendix gives tabulated information about the occupations of the subjects. (SLD)

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THE EFFECT OF AGE, EDUCATION, AND WORK EXPERIENCE ON GENERAL APTITUDE TEST BATTERY VALIDITY AND TEST SCORES

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THE EFFECT OF AGE, EDUCATION, AND WORK EXPERIENCE ON GENERAL APTITUDE TEST BATTERY VALIDITY AND TEST SCORES

by

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ACKNOWLEDGMENT

The United States Employment Service conducts a test research program for developing testing tools useful in vocational counseling and placement.

The purpose of this series of reports is to provide results of significant test research projects as they are completed. These reports will be of interest to users of USES tests and to test research personnel in State agencies and other organizations.

William Goode of the Northern Test Development Field Center and John Hawk of the Division of Planning and Operations assisted in the preparation of this report.

ABSTRACT

This study used meta-analysis research techniques to analyze the effect of age, education, and work experience on General Aptitude Test Battery (GATB) validities and test scores. The sample consisted of 30,568 subjects from 143 Specific Aptitude Test Battery (SATB) validation or revalidation studies analyzed since 1972.

The effect of age, education, and work experience on GATB validities was investigated using the 24,219 sample members rated on the Standard Descriptive Rating Scale. Each variable was divided into intervals, and validities compared. Partial correlations were also used to determine the effect of each variable on GATB validities.

The comparison of validities between age intervals was conducted for all jobs and for job families (Hunter, 1983). There were slightly more significant differences between validities for all jobs than would be expected by chance (Brozek and Tiede, 1952). There was no consistent pattern of older workers having higher or lower validities. When the validities for age intervals were compared for job families, the number of significant differences was less than what would be expected by chance. When age was controlled for, validities increased an average of .02 correlation points.

Education showed positive correlations with all nine GATB aptitudes, with the highest correlations for the cognitive aptitudes and lower correlations for the psychomotor aptitudes. Validities were higher for subjects with more than 12 years of education, particularly for the cognitive aptitudes. When education was controlled for, validities decreased an average of .01 correlation points.

There were more differences than would be expected by chance in validities between experience levels, but the pattern is not consistent across the nine aptitudes. The cognitive aptitudes had lower validities for more experienced workers and the psychomotor aptitudes had slightly higher validities for more experienced workers. When experience was controlled for, validities increased an average of .03 correlation points.

INTRODUCTION

The U.S. Employment Service (USES), in cooperation with State Employment Security Agencies, has conducted a continuing program of occupational test research and development since the mid-1930s. Most of this effort has been devoted to developing and researching the General Aptitude Test Battery (GATB). The GATB consists of 12 tests measuring the following nine vocationally-relevant aptitudes:

General Learning Ability (G)
Verbal Aptitude (V)
Numerical Aptitude (N)
Spatial Aptitude (S)
Form Perception (P)
Clerical Perception (Q)
Motor Coordination (K)
Finger Dexterity (F)
Manual Dexterity (M)

The validation of the GATB for specific occupations has resulted in the development of over 470 Specific Aptitude Test Batteries (SATBs). These batteries consist of combinations of two, three, or four GATB aptitudes with associated cutting scores. All of the SATBs were developed from empirical research studies. In each study criterion data measuring job proficiency were collected along with GATB test scores. The validity of the aptitudes was measured by the correlation between aptitude test scores and the criterion.

One issue that the USES has been concerned with is what variables affect or moderate GATB validities. Some of the variables that have been postulated to moderate test validity are minority group status, sex, geographic area, age, education, and work experience. The present study looks at three of these variables - age, education, and work experience. The study uses meta-analysis research techniques on SATB validation data to determine how age, education, and work experience affect GATB validities and scores.

Previous work with aptitude and intelligence tests has shown a general decline in test scores with age. The time of onset and amount of decline varies greatly with the nature of the test and the type of research designs. Cross-sectional studies with intelligence and aptitude tests generally show declines in scores as early as the twenties and thirties (Jones, 1955; Jones & Conrad, 1933; Miles & Miles, 1932; Schaie and Labouvie-Vief, 1974; Schaie, 1977, Wechsler, 1958; Thumin, 1979). Longitudinal studies on the other hand typically show increases or maintenance of test scores until well into life, with significant declines often occurring no earlier than the late 50s or 60s. Both types of studies pose important questions though. Concurrent studies may be showing generational (cohort) differences reflecting changes in the nature of education and societal influences of individuals who have matured in different time periods. Results from longitudinal studies may be influenced by well-established practice effects, with increases (or lack of declines) brought on by previous experience with the measurement instrument. And declines seem less prevalent on non-speeded, verbal ability, and other 'fluid'-intelligence measures (Doppelt & Wallace, 1955; Wechsler, 1958; Whiteman and Jastak, 1957; Lorge, 1936; Schaie, 1977).

A large study of age effects on GATB scores closely parallels these previous findings (U.S. Department of Labor [USDOL], 1970). Significant declines appeared for eight of the nine GATB aptitudes, with no significant decline for Verbal Aptitude, and the smallest declines for the other cognitive aptitudes G and N. Greatest declines appeared for Form Perception, Finger and Manual Dexterity, with drops approaching 40 points between the ages of 17 to 72. Declines for aptitudes G and N did not begin before age 42, and earliest declines were for aptitudes S and P, both beginning prior to age 20.

Evidence for differences in validities across age groups has been less well documented. Several small studies (USDOL, 1970) which cross-validated SATB norms derived on young and old samples proved inconclusive. Comparisons between validities for age-adjusted GATB scores and unadjusted scores showed small and inconsistent changes in validities (Droege, 1967). Of the 11 SATB studies investigated only one showed significantly higher validities (averaging .03 higher), two showed significantly lower validities (averaging .05 lower), and a median difference of .00 across all studies.

A great deal of information has been reported on GATB mean differences across high school grade level (USDOL, 1970). Scores on all aptitudes increase through completion of high school. Specific aptitude scores have also shown increases, although less consistently, in response to related curricula. Students in a variety of college programs demonstrate significant differences in mean scores, with professional level college students performing better than four year college students, and better still than two year college students. Validities in this study were positive for all aptitudes, with the cognitive aptitudes, and G in particular, serving as very strong predictors. Although often used as a hiring criterion, education level has not been strongly linked with job success, and its effect as a moderator of aptitude validities in occupational studies is not proven. In a review of 515 SATB studies, Hunter & Hunter (1984) found the average validity of education level to be .12.

Much intuitive as well as empirical evidence has been offered to support the positive relationship between experience on the job and success in that job. Studies with the Armed Forces Qualifications Test showed increases in job performance with experience across wide ranges of job complexity and aptitude scores (Vineberg & Taylor, 1970). The validity of experience in 490 SATB studies averages .18 (Hunter & Hunter, 1984). Intuitively it is accepted that experience and training do increase job performance. The effect of these variables on aptitude score validities for these occupations has not been established.

SAMPLE

The sample consists of available data from Specific Aptitude Test Battery validation or revalidation studies analyzed since 1972. The total N is 30,568 from 143 studies. One hundred and thirty-four studies (N=27,835) used a concurrent design and nine studies (N=2,733) used a longitudinal design. Table 1 gives ethnic/minority and sex breakdown.

TABLE 1

Ethnic/Minority Composition of Sample for Males and Females

N=29,745[a]

Ethnic/Minority Group	Males N=14,864	Females N=14,881
Black	3,445	4,865
American Indian	268	204
Asian	252	250
Hispanic	1,138	964
White	9,761	8,598

[a]Information unavailable for 823

Most of the criterion data consisted of the sum of scores from two administrations of the Standard Descriptive Rating Scale. The scale was used to get ratings from supervisors on five aspects of job performance (quantity, quality, accuracy, job knowledge, and job versatility) as well as "all-around" ability. However, other types of criterion data were collected and criteria were combined in different ways (see Table 2). The Appendix contains a listing of the number of subjects in each study.

As part of the data collection, subjects were asked to supply information on their age, education, plant experience and total experience. Plant experience is defined as the number of months worked in the present occupation for the current employer. Total experience is defined as the number of months worked in the occupation for all employers. This information was supplied by subjects and was not verified with other sources. In a few instances, the information on age and experience was inconsistent, e.g., the number of years of experience was greater than the subjects' ages. In these cases, the experience was coded as missing data.

PROCEDURE

The variables under investigation in this study, age, education, plant experience and total experience are continuous. So to investigate mean differences, the variables were divided into intervals or levels. Age (measured in years) was divided into nine intervals (16-19, 20-25, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, and 55-74). Education (measured in years) was divided into three intervals (less than 12, 12, and more than 12). Plant experience (measured in months) was divided into three intervals (less than 12, 12-47, and more than 47). Total experience (measured in months) was divided into four intervals (less than 12, 12-47, 48-119, and more than 119).

Mean scores for each GATB aptitude were computed for each interval of age, education, plant experience and total experience. Analyses of variance were performed between intervals of each variable for the nine GATB aptitudes.

The effect of age, education and experience on GATB validity was investigated using the 24,219 sample members for which ratings on the Standard Descriptive Scale were available. Validities were computed for each GATB aptitude for each interval of age, education, plant experience and total experience.

The validity analysis was conducted across all jobs and separately by job families (Hunter, 1983). Hunter developed a grouping system of jobs based on the Data and Things ratings of occupational codes in the Dictionary of Occupational Titles (DOT) (USDOL, 1977). Each job in the DOT is in one of the five job families (see Table 3). The regression weights for each job family were used to get predicted criterion scores and the correlation was computed between predicted and actual criterion scores. The job family validities were compared between the nine age intervals within each of the five job families.

TABLE 2

Number of Studies and Subjects for Each Criterion Type

	Type of Study	# of Study	# of Individuals	Criterion Measure		
				CR1	CR2	CR3
1.	Standard DRS concurrent	114	24,219	Standard DRS	Standard DRS	Sum of CR1 and CR2
2.	Two criteria collected but only one used as final	1	119	Special DRS	Work Sample	CR2
3.	Multiple Hurdle	3	827	Standard DRS	Course grades	
		1	933	Special DRS	Standard DRS	
		1	95	Course grades	Standard DRS	
4.	Final criterion is combination of different criteria	1	213	Special DRS	Ranking	Combination of CR1, CR2
		1	81	Standard DRS	Performance Model	Combination of CR1, CR2
		1	123	Special DRS	Standard DRS	Combination of CR1, CR2
		1	286	Mixed Standard	Standard DRS	Combination of CR1, CR2
5.	Final criterion is combination of same criteria (not Standard DRS)	1	119	Course grades	Course grades	Sum of CR1 and CR2
		3	723	Broad category rating	Broad category rating	Sum of CR1 and CR2
		1	141	Ranking	Ranking	Sum of CR1 and CR2
		10	1,902	Special DRS	Special DRS	Sum of CR1 and CR2
6.	Longitudinal standard DRS	1	81	Standard DRS	Standard DRS	Sum of CR1 and CR2
7.	Only one criterion	1	270	----------	Special DRS	----------
		1	107	Mixed Standard Rating Scale	----------	----------
		1	329	Course grades	----------	----------
		143	30,568			

TABLE 3

Job Family and Test Battery Composition

Job Family	Contribution to Composite: Cognitive GVN	Perceptual SPQ	Psychomotor KFM	DOT Data-Things Code
1	59%	30%	11%	T=0=Setting up
2	13%		87%	T=6=Feeding-Offbearing
3	100%			D=0=Synthesizing =1=Coordinating
4	73%		27%	D=2=Analyzing =3=Compiling =4=Computing
5	44%		56%	D=5=Copying =6=Comparing

The effect of age, education, and experience on validity was also investigated through partial correlation analysis. Partial correlations measure the correlation between two variables (in this case test score and criterion) controlling for or holding constant other variables (in this case age, education, plant experience and total experience). Partial correlations between each aptitude and the criterion were computed controlling separately for age, education, plant experience, and total experience. Partial correlations were also computed controlling simultaneously for age, education, and plant experience; and for age, education, and total experience.

RESULTS

The mean aptitude scores for each age interval are shown in Table 4. The analysis of variance results between age intervals were significant (at the .01 level) for each aptitude. The general pattern is for mean scores to increase slightly from the first interval (less than 20 years), stay about the same for the next two intervals (20-29 years) and then decline. Aptitude V shows the least decline while aptitudes P, F, and M show the largest decline. The mean scores of each age interval for each aptitude are depicted graphically in Figures 1-9.

The results for the analyses of variance for education are shown in Table 5. The results are consistent for all aptitudes - the low education interval (less than 12 years) had the lowest mean and the high education level (more than 12 years) had the highest mean. All of the Fs are significant (at the .01 level).

The results for comparisons of mean aptitude scores for the intervals of plant and total experience are shown in Tables 6 and 7. For both plant and total experience, mean aptitude scores for subjects in the highest interval of experience were lower than the other intervals of experience. For aptitudes G, V, N, S, and M mean scores were highest for subjects with 12-47 months of both plant and total experience. For aptitudes P, Q, K, and F subjects with 1-12 months plant and total experience had the highest mean scores. These results are similar to those for age as shown by the correlations between age and plant experience (.55) and total experience (.62).

Table 8 shows the correlations between age, education, plant experience, total experience, final criterion and the nine GATB aptitudes. The correlations for age and education were computed on the total sample (N=30,568). Due to longitudinal studies and missing data, the correlations were computed on smaller samples for plant experience (N=27,375) and total experience (N=27,514). The final criterion correlations were computed with the 24,219 sample members for which ratings on the Standard Descriptive Rating Scale were available. The correlations between age, education, and experience and the aptitudes reflect the results for mean scores. Education correlated positively with all nine aptitudes. Age and experience showed negative correlations with all nine aptitudes.

TABLE 4

Analysis of Variance Results for Age Intervals

Age Interval	16-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-74	
N	2,038	7,397	6,640	4,353	3,060	2,343	1,874	1,503	1,360	
	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	F[a]
G	96.7	98.4	98.7	96.4	93.1	92.0	91.3	89.1	88.5	122.41
	15.7	18.0	19.6	20.1	19.3	19.4	18.6	17.9	17.1	
V	96.3	98.1	98.1	96.3	94.0	94.0	93.8	93.3	93.2	54.38
	13.0	15.2	16.7	16.9	16.3	16.5	16.2	16.0	15.4	
N	95.6	97.5	97.6	95.4	91.5	89.9	88.9	86.8	86.2	146.66
	17.4	18.5	20.1	20.8	20.2	20.5	20.0	19.5	18.8	
S	103.0	103.1	102.7	100.5	97.9	95.7	94.6	92.0	89.3	163.97
	18.7	19.6	20.3	20.5	19.9	19.7	18.5	17.6	16.8	
P	114.1	113.7	110.7	106.3	101.8	97.3	93.7	89.9	84.7	670.21
	19.6	20.1	20.6	20.7	21.1	21.2	20.4	20.0	19.1	
Q	113.6	114.9	113.2	110.8	107.6	105.3	103.4	102.1	100.5	248.18
	18.1	17.6	18.0	17.9	17.7	18.4	17.8	18.2	17.6	
K	106.6	108.4	107.9	105.5	102.1	99.8	96.1	93.8	90.6	310.15
	17.4	17.5	18.2	18.1	18.9	19.5	19.1	19.9	19.0	
F	102.3	103.5	102.3	99.8	95.4	91.1	85.8	81.5	75.0	577.77
	19.9	20.7	20.6	20.5	20.1	20.4	20.2	20.0	19.8	
M	106.3	109.8	110.8	109.0	104.6	100.8	94.9	90.1	84.1	449.36
	20.4	21.3	21.0	21.4	21.3	21.1	21.6	21.5	21.4	
CR3	41.0	42.4	43.5	43.8	44.2	44.6	44.1	43.7	43.7	38.10
	8.1	8.0	8.0	8.2	8.1	8.1	8.3	8.2	8.1	
Education	11.9	12.5	12.7	12.3	11.9	11.7	11.5	11.2	11.2	285.09
	1.0	1.5	1.8	1.8	1.8	2.0	2.0	2.1	2.1	

[a]All significant at 01 level.

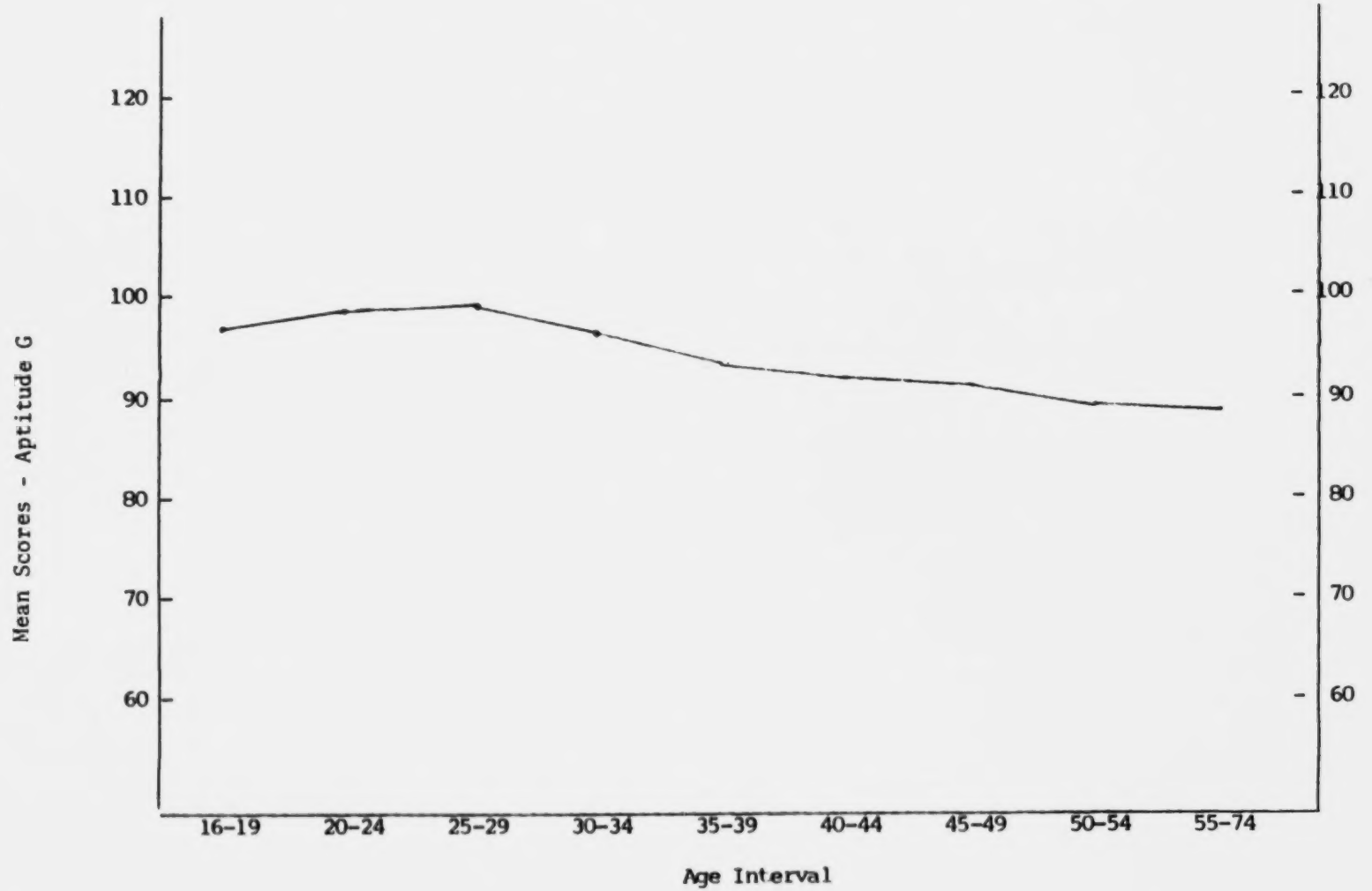

Figure 1. Age curve for aptitude G.

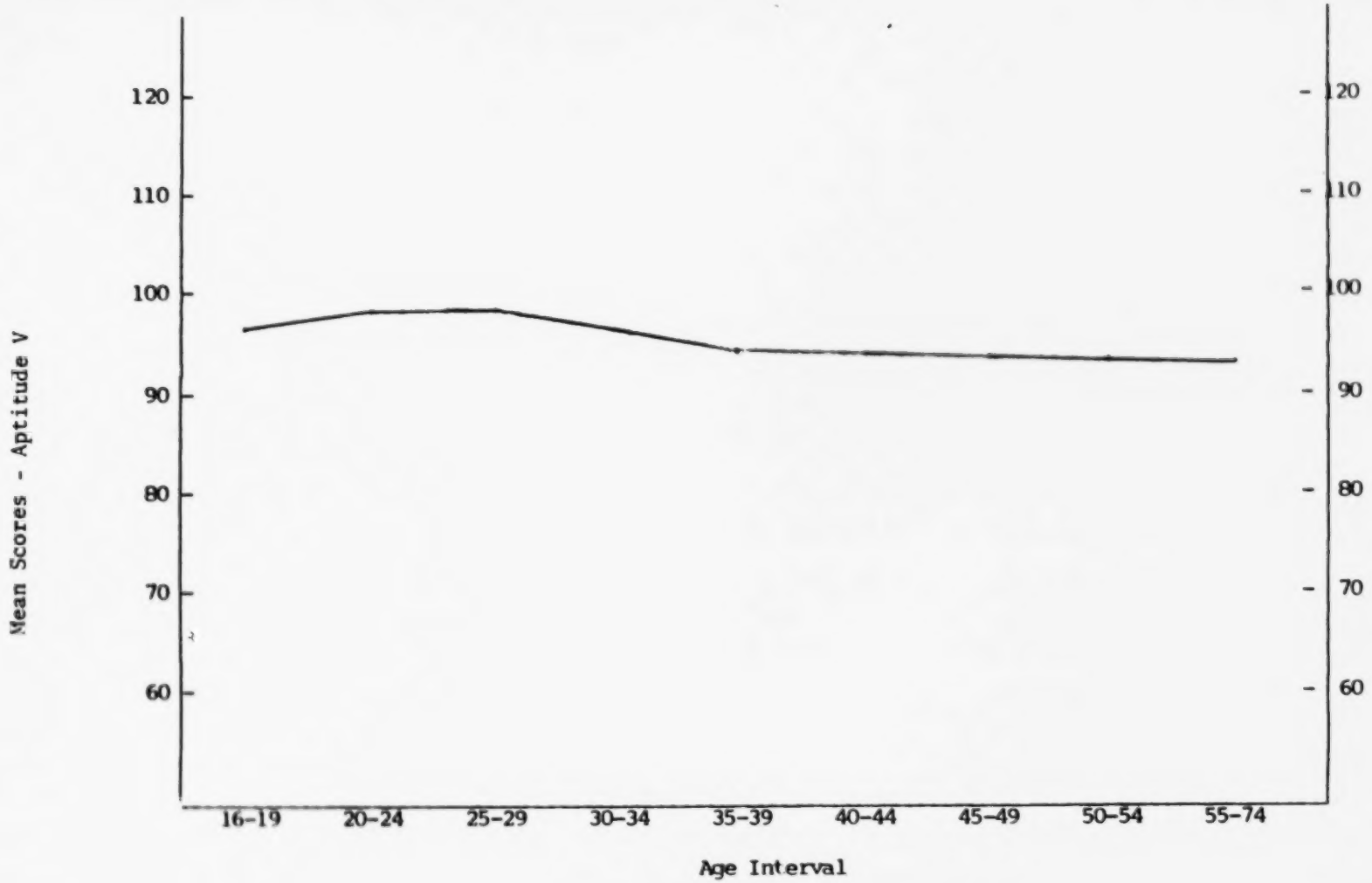

Figure 2. Age curve for aptitude V.

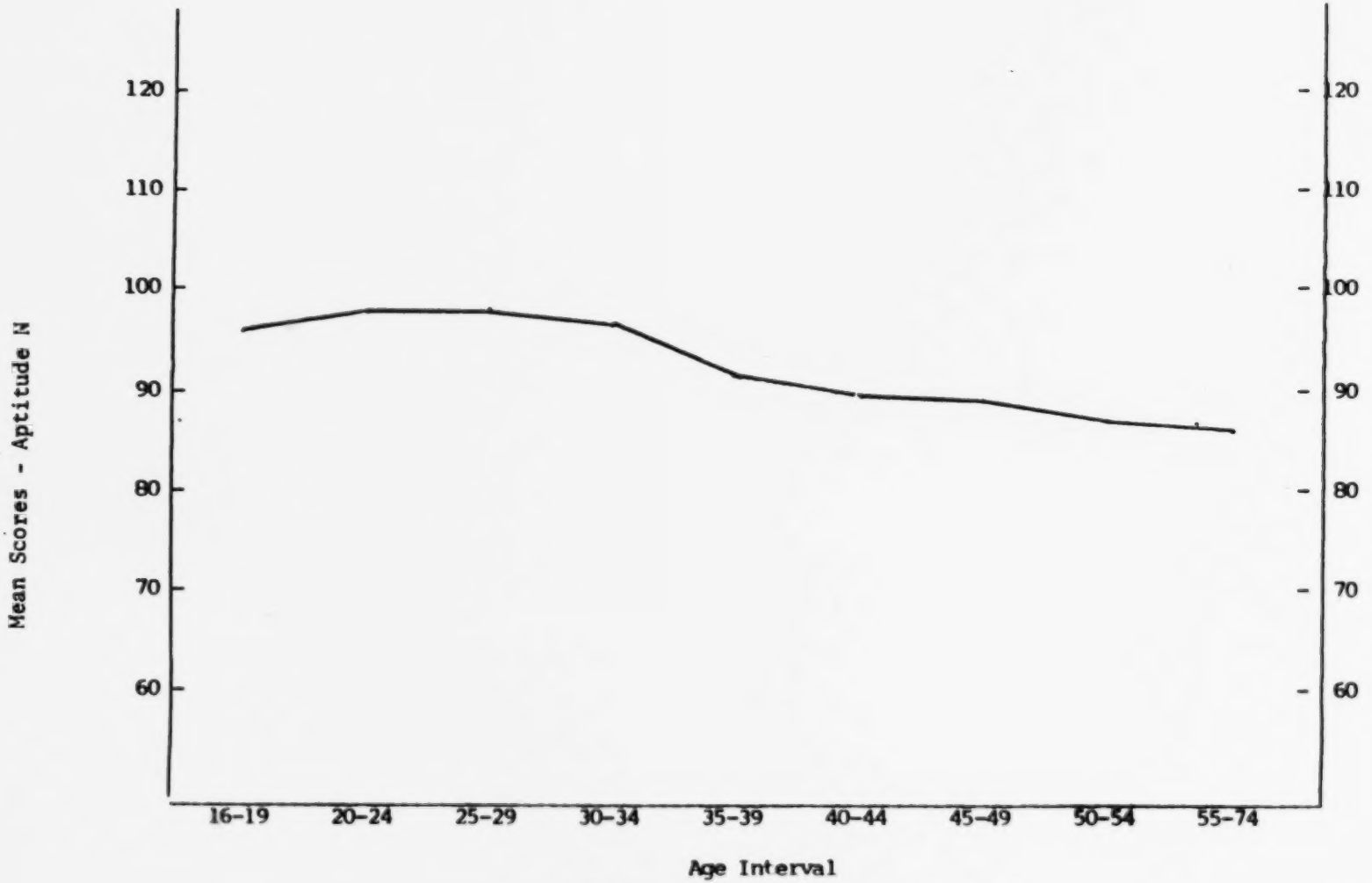

Figure 3. Age curve for aptitude N.

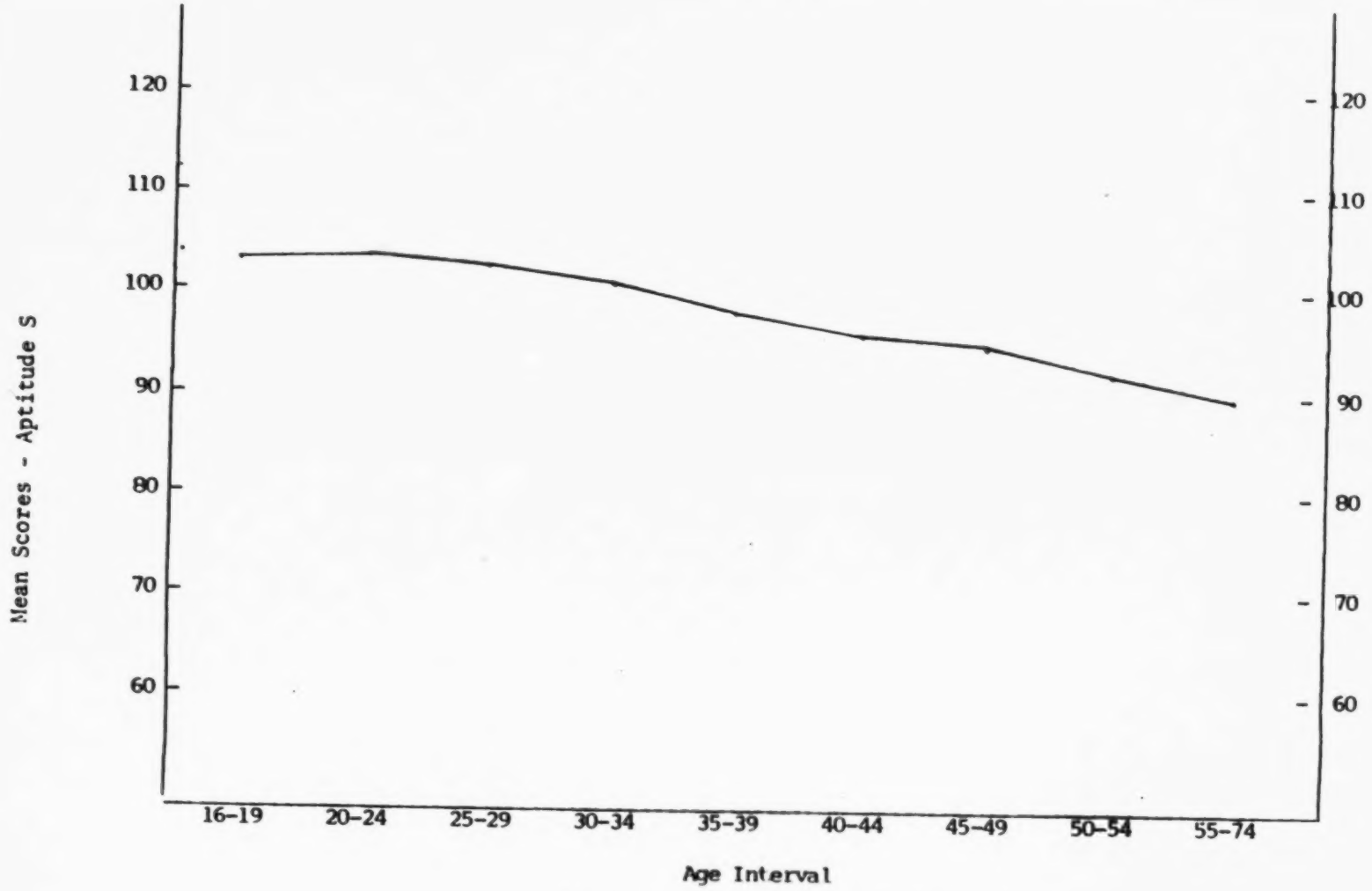

Figure 4. Age curve for aptitude S.

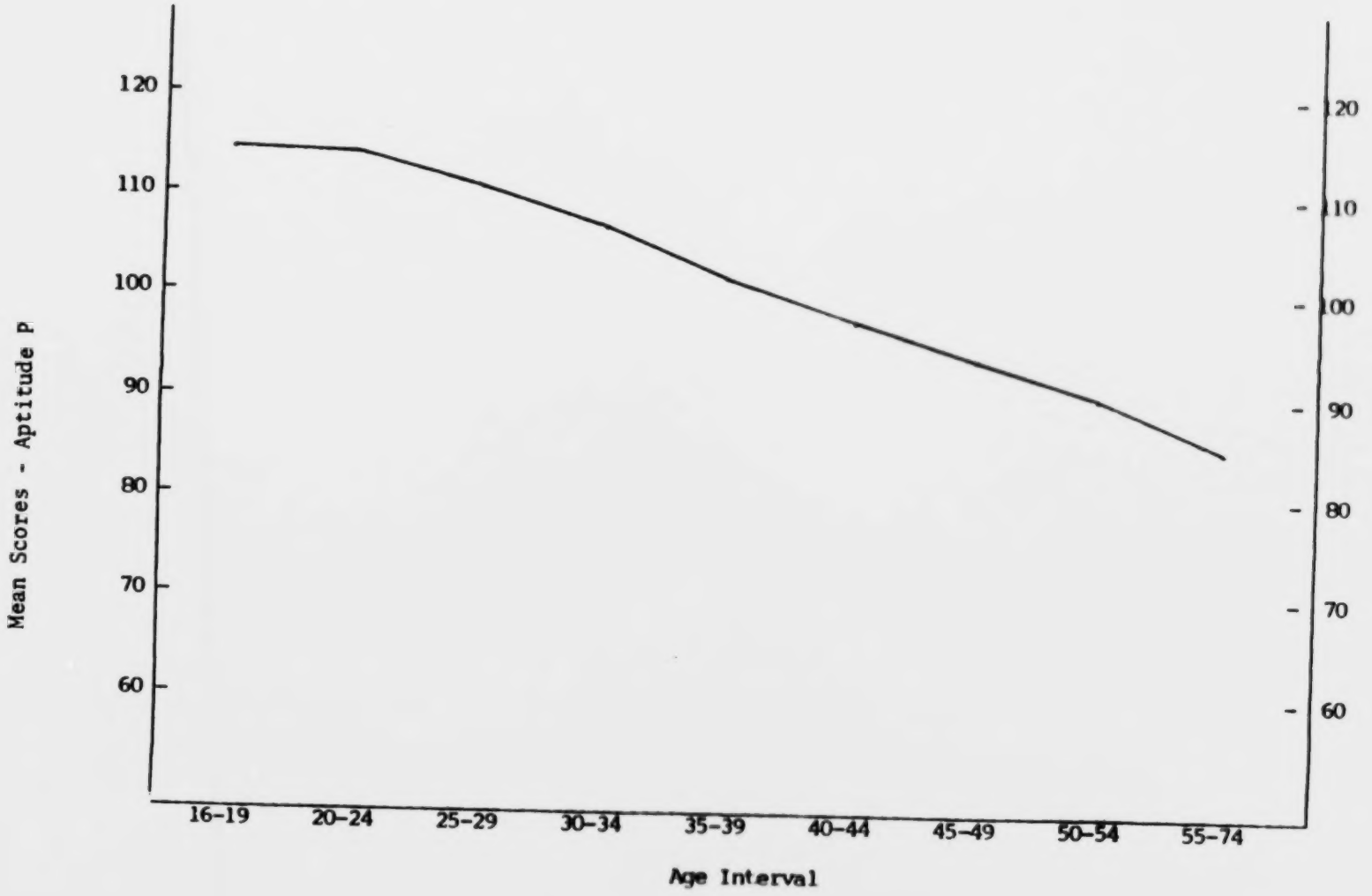

Figure 5. Age curve for aptitude P.

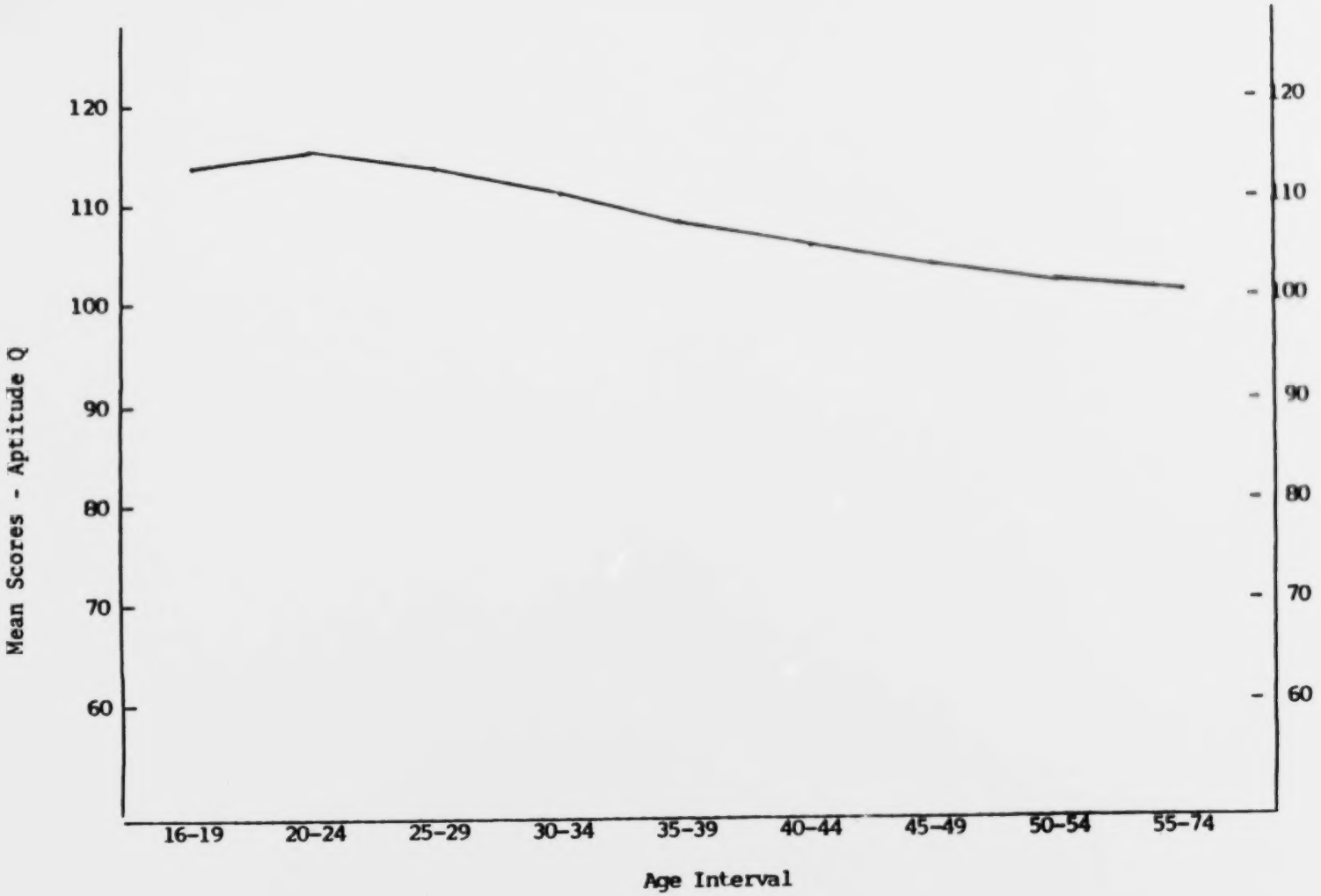

Figure 6. Age curve for aptitude Q.

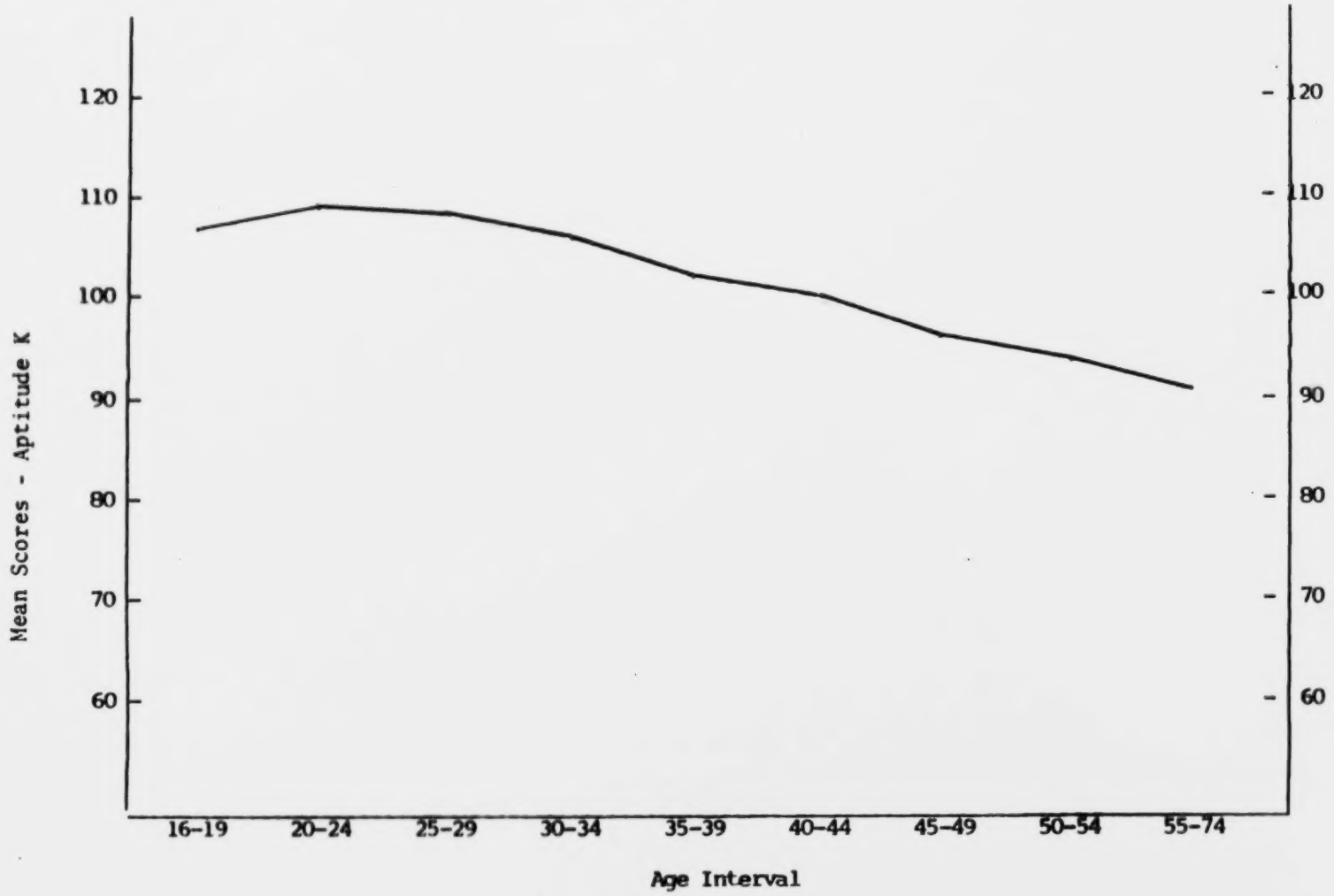

Figure 7. Age curve for aptitude K.

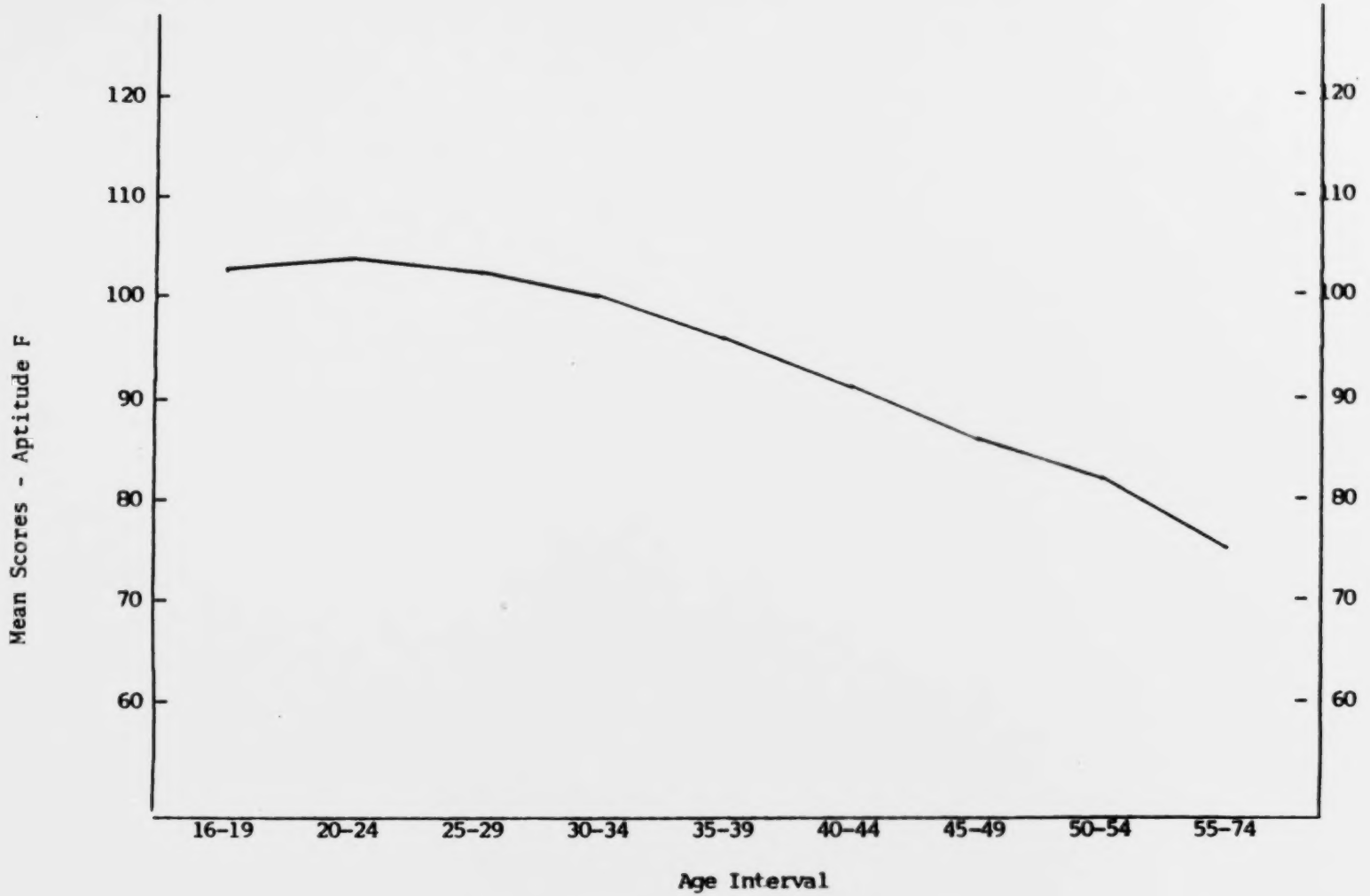

Figure 8. Age curve for aptitude F.

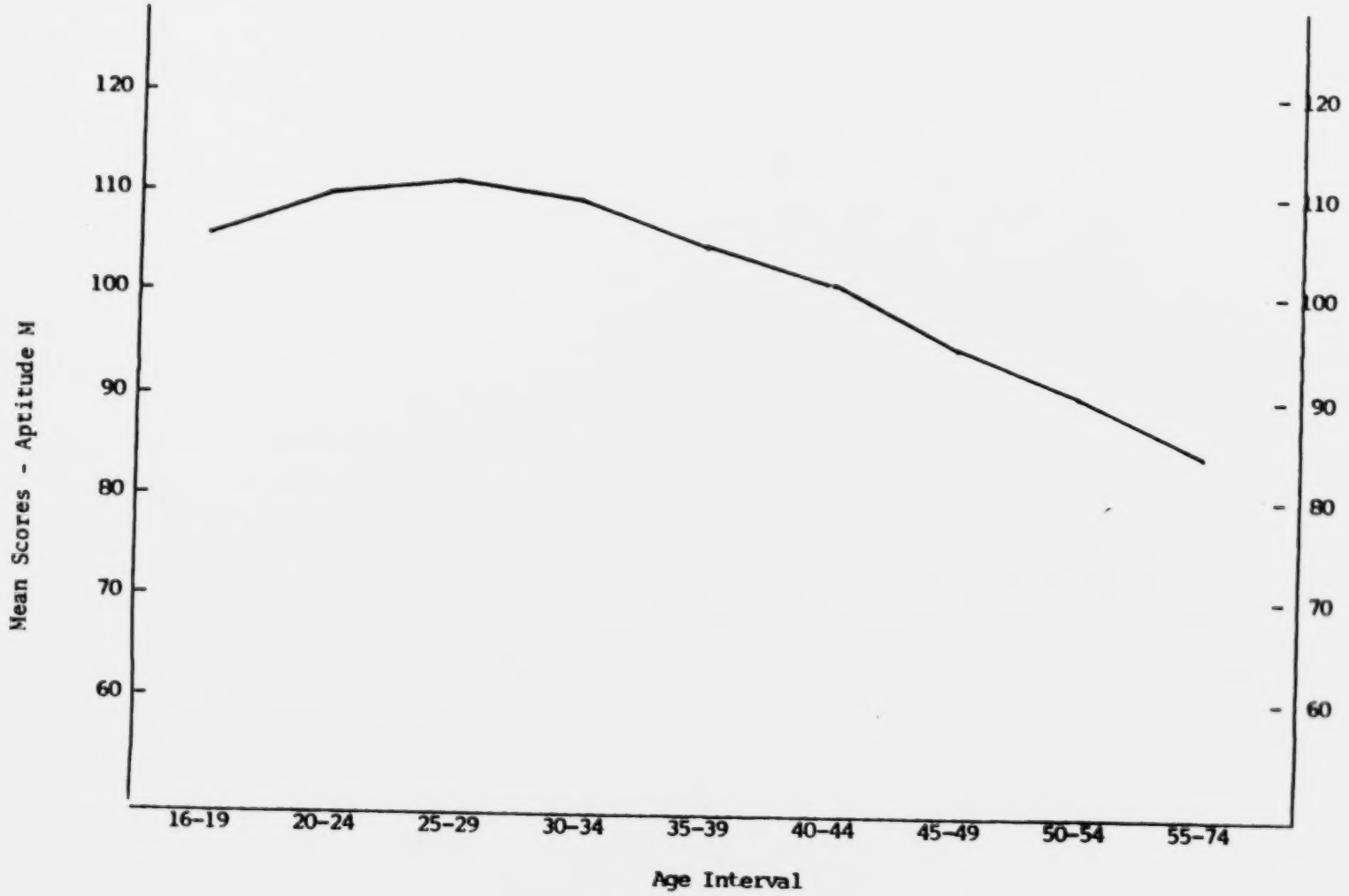

Figure 9. Age curve for aptitude M.

TABLE 5

Analysis of Variance Results for Education

Education Interval	Less than 12 years		12 years		More than 12 years		
N	5,899		15,875		8,794		
	Mean	SD	Mean	SD	Mean	SD	F[a]
G	81.9	16.4	95.2	17.0	105.9	18.1	3,452.72
V	85.1	12.9	95.5	14.1	105.1	16.2	3,363.51
N	79.5	19.0	94.4	17.9	104.3	17.9	3,292.31
S	90.0	18.1	100.0	19.4	106.3	19.7	1,274.45
P	91.8	22.2	106.9	20.6	113.5	20.4	1,957.66
Q	97.5	16.3	110.8	17.0	118.4	17.6	2,675.36
K	92.9	18.9	104.6	17.9	111.0	17.7	1,779.64
F	90.1	21.8	98.0	21.5	101.2	21.4	485.37
M	98.5	22.3	106.1	22.1	108.8	22.1	397.56
CR3	42.6	8.2	43.3	8.1	44.0	8.1	39.95

[a]All significant at .01 level.

TABLE 6

Analysis of Variance Results for Plant Experience

Plant Experience (months)	Less than 12		12-47		48 or more		
N	6,184		11,130		10,061		
	Mean	SD	Mean	SD	Mean	SD	F[a]
G	95.4	18.9	96.5	19.1	92.9	18.8	97.81
V	96.8	16.1	96.8	16.0	94.2	15.7	86.24
N	94.3	19.6	95.2	19.8	91.5	20.2	96.27
S	99.8	19.6	101.0	20.3	96.8	19.6	124.98
P	109.7	21.3	108.7	21.8	99.8	22.1	578.40
Q	113.5	18.3	112.2	18.0	107.1	18.1	302.87
K	107.0	18.2	106.1	18.3	100.7	19.7	299.40
F	100.5	21.3	99.7	21.5	91.9	22.2	443.18
M	106.6	21.2	107.6	21.9	101.6	23.3	212.78
CR3	40.8	8.0	43.3	7.9	45.2	7.9	519.21

[a]All significant at .01 level.

TABLE 7

Analysis of Variance Results for Total Experience

Total Experience (months)	Less than 12		12 - 47		48 - 119		120 or more		
N	4,313		9,746		7,810		5,645		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F[a]
G	94.0	18.5	95.4	19.0	94.5	19.4	93.7	18.5	11.06
V	95.6	15.7	96.1	16.0	95.3	16.2	94.7	15.7	9.45
N	93.2	19.4	94.3	19.8	93.2	20.4	91.2	19.7	28.33
S	98.7	19.3	99.9	20.0	98.7	20.3	97.7	19.5	16.08
P	108.5	20.9	108.4	21.9	104.4	22.0	96.7	21.7	392.17
Q	111.9	18.5	111.6	18.4	109.8	18.6	105.3	17.9	166.85
K	106.4	17.7	106.2	18.4	104.2	19.1	97.1	19.9	317.97
F	100.5	21.0	99.7	21.3	96.9	21.6	87.8	21.8	428.64
M	105.9	20.5	107.1	21.3	105.6	22.4	97.4	23.3	256.24
CR3	40.1	7.9	42.8	7.9	44.3	7.9	45.7	7.9	395.21

[a]All significant at .01 level.

TABLE 8

Correlations Between GATB Aptitudes and Age, Education, Plant Experience, and Total Experience

	Age	Education	Plant Experience	Total Experience	Criterion
Age	1.00				
Education	-.21	1.00			
Plant Experience	.55	-.17	1.00		
Total Experience	.62	-.13	.77	1.00	
Criterion	.08	.06	.17	.18	1.00
G	-.16	.44	-.08	-.03	.21
V	-.10	.45	-.07	-.03	.18
N	-.18	.43	-.09	-.06	.21
S	-.20	.27	-.09	-.05	.13
P	-.39	.34	-.23	-.22	.15
Q	-.24	.39	-.17	-.14	.17
K	-.27	.33	-.19	-.20	.11
F	-.35	.17	-.22	-.24	.10
M	-.29	.15	-.18	-.19	.10

Note. All correlations significant at .01 level.

Table 9 shows the validities of each aptitude for each age interval. Inspection of Table 9 shows that validities are stable for each aptitude across age intervals. Critical ratios were computed between validities of each age interval for each aptitude. There are 324 possible comparisons (36 for each aptitude). When a number of significance tests are performed, a certain number would be expected to be significant by chance. Brozek and Tiede (1952) discuss how to determine the number of tests expected to be significant if there are not differences in the population. Twenty eight of the critical ratios were significant at the .05 level which is more than the 24 that would be expected. One explanation for this is that the assumption of independence was not met. Each validity coefficient was involved in eight comparisons. Also, there was no consistent pattern of validities being higher for younger or older workers. Younger workers had higher validities for 13 of the significant differences and lower validities for the other 15 significant differences.

Table 10 shows the job family (Hunter, 1983) validities for each age interval. Validity coefficients were only computed when there were more than 20 sample members for an age interval. Critical ratios were computed between each age interval for each job family. Eleven of the 132 critical ratios were significant at the .05 level which is less than the 11.5 that would be expected by chance.

The validities for each education interval are shown in Table 11. There is a consistent pattern of higher validities for subjects with more than 12 years of education. Critical ratios were computed between validities for education levels for each aptitude. Twelve of the 27 critical ratios were significant (at the .05 level) which is more than would be expected by chance. There were significant differences for seven aptitudes between education levels 2 and 3; and for four aptitudes between education levels 1 and 3.

The validities for each level of plant and total experience are shown in Tables 12 and 13. Critical ratios were computed between experience intervals for each aptitude. Twelve of the 27 critical ratios for plant experience and 21 of the 36 critical ratios for total experience were significant (at the .05 level). Both of these results are more than would be expected by chance. For aptitudes G, V, N, S, and P the highest level of experience showed lower validities than the other levels of experience. For aptitudes Q, K, and M one of the lower levels of experience had the lower validities. While there were more significant differences than would be expected, the magnitude of the differences is not great. For plant experience, the largest difference is .057 correlation points, while for total experience the largest difference is .073 correlation points.

Table 14 shows the validity coefficients controlling for age, education and experience. These partial correlations show the correlation between aptitudes and criterion controlling for the correlations between the variables (age, education, and experience) and aptitudes and criterion. The first column in Table 14 shows the zero order correlations or validity coefficients without

TABLE 9

Validities for Each Age Interval

	Age Interval								
	16-19	20-24	25-29	30-34	35-39	4-44	45-49	50-54	55-74
N	1,456	5,576	5,121	3,474	2,532	1,941	1,597	1,318	1,204
G	.22	.25	.22	.22	.18	.20	.23	.22	.25
V	.19	.24	.18	.18	.15	.17	.17	.18	.19
N	.25	.25	.23	.22	.19	.19	.22	.19	.22
S	.10	.15	.13	.14	.14	.15	.20	.16	.21
P	.19	.20	.17	.20	.18	.19	.21	.21	.24
Q	.20	.23	.21	.21	.19	.18	.20	.17	.16
K	.12	.15	.12	.15	.15	.13	.12	.11	.11
F	.12	.14	.13	.14	.16	.13	.14	.12	.09
M	.13	.11	.11	.09	.14	.13	.14	.15	.17

Note. All correlations significant at .01 level.

TABLE 10

Job Family Validities for Age Intervals

Job Family	Age Interval 16-19 N		20-24 N		25-29 N		30-34 N		35-39 N		40-44 N		45-49 N		50-54 N		55-74
1	24	.07	178	.14*	268	.12*	192	.32**	162	.04	111	.07	85	.33**	65	.34**	66	.39**
2	7	—	26	.16	21	.24	17	—	21	.33	12	—	11	—	8	—	3	—
3	1	—	62	.18	137	.09	91	.42**	45	.17	50	.41**	39	.19	33	.45**	19	—
4	900	.30**	3,298	.27**	2,989	.27**	1,922	.22**	1,304	.24**	1,032	.22**	865	.21**	693	.27**	651	.26**
5	524	.19**	2,012	.26**	1,706	.20**	1,252	.22**	1,000	.24**	735	.23**	598	.27**	519	.17**	465	.20**

*Significant at .05 level.
**Significant at .01 level.

TABLE 11

Validities for Education Intervals

Education Interval

	Less than 12 years N=4,904	12 years N=12,675	More than 12 years N=6,640
G	.18	.18	.25
V	.14	.16	.21
N	.17	.19	.24
S	.14	.09	.16
P	.15	.11	.17
Q	.15	.15	.19
K	.10	.09	.10
F	.10	.08	.12
M	.11	.09	.11

Note: All correlations significant at .01 level

TABLE 12

Validities for Plant Experience Intervals

Plant Experience Intervals

	Less than 12 months N=5,518	12-47 months N=9,259	48 or more months N=9,019
G	.24	.24	.20
V	.21	.22	.17
N	.23	.24	.21
S	.16	.15	.14
P	.18	.20	.19
Q	.18	.23	.21
K	.10	.16	.16
F	.12	.16	.15
M	.10	.13	.15

Note: All correlations significant at .01 level

TABLE 13

Validities for Total Experience Intervals

Total Experience Intervals

	Less than 12 months N=3,737	2-47 months N=8,376	48-119 months N=7,019	120 or more months N=4,934
G	.23	.23	.21	.19
V	.20	.21	.19	.16
N	.22	.23	.22	.21
S	.18	.14	.13	.12
P	.20	.20	.21	.18
Q	.19	.22	.24	.19
K	.11	.14	.18	.15
F	.13	.16	.16	.14
M	.13	.11	.15	.15

Note: All correlations significant at .01 level

TABLE 14

Partial Correlations

	Zero Order	Age	Education	Plant Experience	Total Experience	Age Ed.	Age, Ed., Plt	Age, Ed., Total
G	.21	.22	.20	.22	.22	.21	.20	.20
V	.18	.19	.17	.19	.19	.17	.17	.17
N	.21	.22	.20	.22	.22	.21	.20	.20
S	.13	.15	.12	.15	.14	.13	.13	.12
P	.15	.19	.13	.19	.19	.18	.18	.18
Q	.17	.20	.16	.21	.21	.19	.19	.19
K	.11	.14	.10	.15	.15	.12	.13	.13
F	.10	.14	.09	.15	.15	.13	.14	.14
M	.10	.13	.10	.14	.14	.13	.13	.13

Note: All correlations significant at .01

controlling for other variables. The second column shows validities controlling for age. These validities average .02 correlation points higher. When education is controlled for, the validities show an average decrease of .01 correlation points. The validities average .03 correlation points higher when experience (either plant or total) is controlled for. When both age and education are controlled simultaneously, the validities increase by an average of .01 correlation points. Controlling for age, education, and plant experience; and age, education and total experience showed an average increase of .01 correlation points.

DISCUSSION AND CONCLUSIONS

The main purpose of this study was to investigate the effect of age, education, and work experience on GATB validities. The analysis was performed in two ways. The first consisted of dividing the sample into groups based on different levels of age, education, and work experience and comparing validities between the different groups. The second method used partial correlations to calculate the validities when age, education, and work experience are controlled for.

GATB validities appear to be stable between different age intervals. The correlations between aptitudes and criterion are about the same for all ages. When age is controlled for, validities increase slightly. All of the data used in investigating validities were collected using a concurrent design. So the present data can't directly answer the question of whether the GATB is equally predictive of future job performance for all ages of applicants. This would require longitudinal studies that include a wide range of ages.

The validities for subjects with more than 12 years of education are higher than for subjects with 12 years of education or less. But these differences in validities do not occur between subjects with 12 years of education and subjects with less than 12 years of education. One possible explanation for this is that the validities are higher for the types of jobs that workers with more than 12 years of education are employed in. There is a very slight decline in aptitude validities when education is controlled for.

The correlation between total experience and the criterion ($r=.18$) is larger than the correlation of six of the aptitudes and the criterion. In other words, workers who have been on the job longer tend to be rated higher by supervisors. The use of experience on the job as a predictor of job performance has limited use in referral or hiring decisions. Most applicants for entry level jobs do not have experience in that job. The correlation between experience and the criterion has the effect of reducing the obtained validity coefficient as shown by the increase in validities when experience is controlled for. The obtained concurrent validity coefficients are underestimates of the validities of the GATB when used to select entry level workers.

The aptitudes fall into two groups in terms of the relationship between validity and levels of experience. Validities for aptitudes G, V, N, S, and P remain about the same or decrease as experience increases, while the validities for aptitudes Q, K, F, and M tend to increase as experience increases. This indicates that after the job is learned, the psychomotor aptitudes become more important than they are while learning the job. Even though the cognitive aptitudes show a slight decrease in validity as experience increases, they still have higher validities at all levels of experience than the psychomotor aptitudes.

The comparison of aptitude scores between age intervals is consistent with previous findings. The pattern is for an increase in scores from the teens, a peak in the 20s and then a gradual decline. The aptitudes differ with V being the most stable and P showing the greatest decline.

REFERENCES

Brozek, J. & Tiede, K. (1952). Reliable and questionable significance in a series of statistical tests. Psychological Bulletin, 49, 339-341.

Doppelt, J. E. & Wallace. (1955). The Wechsler Adult Intelligence Scale for older persons. Journal of Abnormal Social Psychology, 51, 312-330.

Droege, R. C. (1967). Effects of aptitude-score adjustments by age curves on prediction of job performance. (1967). Journal of Applied Psychology, 31, 181-186.

Hunter, J. E. (1983). Test validation for 12,000 jobs: An application of job classification and validity generalization to the General Aptitude Test Battery (GATB). Washington, DC: U.S. Department of Labor, Employment and Training Administration.

Hunter, J. E. & Hunter, R. F. (1984). Validity and utility of alternative predictors of job performance. Psychological Bulletin, 96(1), 72-98.

Jones, H. E. (1955). Age changes in adult mental abilities. Old age in the modern world. London: Livingstone.

Jones, H. E. & Conrad, H. S. (1933). The growth and decline of intelligence. Genetic Psychological Monographs, XIII, 223-298.

Lorge, I. (1936). The influence of the test upon the nature of mental decline as a function of age. Journal of Educational Psychology, 27, 100-110.

Miles, C. C. & Miles, W. R. (1932). The correlation of intelligence scores and chronological age from early to late maturity. American Journal of Psychology, 44, 44-78.

Schaie, K. W. (1977). Intelligence and problem solving. In J. E. Birren and K. W. Schaie (Eds.), Handbook of the psychology of aging. New York: Van Nostrand Reinhold Co.

Schaie, K. W. & Labouvie-Vief, G. V. (1974). Generalizational versus ontogenetic components of change in adult cognitive behavior: a fourteen year cross sequential study. Developmental Psychology, 10, 305-320.

Thumin, F. J. (1978). Performance on tests of power and speed related to age among male job applicants. International Journal of Aging and Human Development, 9(3), 255-261.

U.S. Department of Labor. (1977). Dictionary of Occupational Titles (4th ed.). Washington, DC.

U.S. Department of Labor. (1970). Manual for the USES General Aptitude Test Battery, Section III: Development. Washington, DC: Government Printing Office.

Vineberg, R. & Taylor, E. N. (1970). Performance in four jobs: The role of mental ability and experience. (Hum. RRO Professional Paper 31-70). Alexandria, Virginia: Human Resources Research Organization.

Wechsler D. (1958). The measurement and appraisal of adult intelligence (4th ed.) Baltimore: Williams and Wilkins.

Whiteman, M. & Jastak, J. (1957). Absolute scaling of tests for different age groupings of a state-wide sample. Educational and Psychological Measurement, 17, 338-346.

APPENDIX

DOT Title and Code and Number of Subjects for each Sample

SATB No. or Study No.	DOT Title	DOT Code	Number of Subjects
2	Stock Clerk	222.387-058	151
4	Sewing Machine Operator	787.682-046	208
7	Laboratory Tester	029.261-010	95
9	Central Office Operator	235.462-010	102
10	Stenographer	202.362-014	622
10	Clerk-Typist	203.362-010	431
10	Typist	203.582-066	141
11	Carpenter	860.381-022	154
11	Carpenter	860.381-022	119
12	Machinist	600.280-022	283
28	Packager, Hand	920.587-018	445
31	Checker II	209.687-010	121
31	Checker II	209.687-010	59
34	Bindery Worker	653.685-010	185
38	File Clerk II	206.367-014	211
43	Automobile Mechanic	620.261-010	425
44	Punch-Press Operator I	615.482-022	89
45	Shipfitter	806.381-046	252
47	Nursery School Attendant	359.677-018	174

SATB No. or Study No.	DOT Title	DOT Code	Number of Subjects
53	Spinner, Frame	682.681-010	180
57	Upholsterer, Inside	780.681-010	199
61	Plumber	862.381-030	253
61	Plumber	862.381-030	411
63	Garment Folder	789.687-066	103
68	Refinery Operator	549.260-010	194
71	Cosmetologist	332.271-010	386
72	Electrician	824.261-010	394
72	Electrician	824.261-010	253
74	Central-Office Repairer	822.281-014	142
80	Radiologic Technologist	078.362-026	137
82	Sheet-Metal Worker	804.281-010	152
101	Assembler, Automobile	806.684-010	213
115	Weaver	683.682-038	126
120	Fire Fighter	373.364-010	130
124	Tractor-Trailer-Truck Driver	904.383-010	320
126	Welder, Combination	819.384-010	220
131	Industrial-Truck Operator	921.683-010	202
135	Production-Machine Tender	609.685-010	227
141	Bench Assembler	706.684-642	160

SATB No. or Study No.	DOT Title	DOT Code	Number of Subjects
144	Machinist, Wood	669.380-014	100
145	Cashier-Checker	211.462-014	119
153	Loom Fixer	683.260-018	156
154	Line Repairer	821.361-026	180
156	Medical Technologist	078.361-014	146
161	Mounter, Automatic	976.685-022	30
165	Packager, Hand	920.587-018	102
168	Yarn-Texturing-Machine Operator	589.685-102	111
177	Millwright	638.281-018	302
179	Waiter/Waitress, Informal	311.477-030	239
180	Keypunch Operator	203.582-030	353
182	Laborer, Stores	922.687-058	127
199	Audit Clerk	210.382-010	300
200	Ticket Agent	238.367-026	210
200	Reservations Agent	238.367-018	310
201	Construction-Equipment Mechanic	620.261-022	233
207	Welder, Arc	810.384-014	162
208	Gas-Appliance Servicer	637.261-018	221
211	Welder, Arc	810.384-014	461
211	Welder, Arc	810.384-014	81

SATB No. or Study NO.	DOT Title	DOT Code	Number of Subjects
214	Wire Drawer	614.382-014	70
217	Proof-Machine Operator	217.382-010	243
220	Coil Winder	724.684-026	115
228	Injection-Molding-Machine Tender	556.685-038	155
231	Surgical Technician	079.374-022	250
234	Office-Machine Servicer	633.281-018	209
235	Metal Fabricator	619.360-014	173
236	Police Officer I	375.263-014	121
238	Cook	313.361-014	114
239	Ward Clerk	245.362-014	185
259	Teller	211.362-018	291
266	Drafter, Civil Drafter, Geological Drafter, Mechanical Drafter, Structural	005.281-010 010.281-018 007.281-010 005.281-014	326
267	Tire Builder, Automobile	750.384-010	239
270	Nurse, Licensed Practical	079.374-014	204
274	Food-Service Worker, Hospital	355.677-010	170
276	Salesperson, General Merchandise	279.357-054	171
276	Salesperson, General Merchandise	279.357-054	90
278	Sales Clerk	290.477-014	163

SATB No. or Study No.	DOT Title	DOT Code	Number of Subjects
280	Structural-Steel Worker	801.361-014	249
281	Electronics Assembler	726.684-018	56
282	Nurse Aide	355.674-014	136
286	Computer Operator	213.362-010	213
287	Psychiatric Aide	355.377-014	334
293	Electronics Technician	003.161-014	402
309	Proof-Machine Operator	217.382-010	172
310	Electronics Assembler	726.684-010	185
313	Automobile-Body Repairer	807.381-010	107
318	Instrument Mechanic	710.281-026	200
326	Respiratory Therapist	079.361-010	496
327	Psychiatric Technician	079.367-022	384
329	Administrative Clerk	219.362-010	407
330	Chemical Operator III	559.382-018	62
332	Hotel Clerk	238.362-010	406
334	Precision-Lens Grinder	716.382-018	123
335	Extruding-Machine Operator	691.382-010	142
336	Knitting-Machine Operator	685.665-014	209
342	Water-Treatment-Plant Operator	954.382-014	222

SATB No. or Study No.	DOT Title	DOT Code	Number of Subjects
343	Operating Engineer	859.683-010	90
343	Operating Engineer	859.683-010	270
348	Correction Officer	372.667-018	850
360	Yarn Winder	681.685-154	207
363	Maintenance Repairer, Factory or Mill	899.281-014	233
370	Maintenance Mechanic	638.281-014	141
375	Lather	842.361-010	114
376	Mailing-Machine Operator	208.462-010	128
379	Transportation Agent	912.367-014	131
381	Electronics Assembler	726.684-018	100
384	Medical-Laboratory Technician	078.381-014	177
393	Hospital-Admitting Clerk	205.362-018	178
394	Envelope-Folding-Machine Adjuster	641.680-010	245
398	Teacher Aide II	249.367-074	266
402	Painter, Transportation Equipment	845.381-014	54
407	Quality Control Technician	529.387-030	152

SATB No. or Study No.	DOT Title	DOT Code	Number of Subjects
414	Assembler, Electrical Accessories	729.687-010	191
417	Telephone Ad-Taker	247.367-010	130
423	Diesel Mechanic	625.281-010	265
427	Spooler Operator, Automatic	681.686-018	126
434	Packager, Machine	920.685-078	193
436	Food-Service Worker, Hospital	355.677-010	127
447	Welder, Production Line	819.684-010	177
456	Assembler, Small Products	739.687-026	183
465	Covering-Machine Operator	681.685-038	65
466	Material Handler	929.687-030	44
467	Electronics Assembler	726.684-018	276
468	Cigarette Inspector	529.567-010	64
469	Chemical Operator II	558.585-014	246
470	Weaver	769.684-050	81
471	Electronics Inspector	726.684-022	644
472	Appliance Assembler, Line	827.684-010	107
473	Gambling Dealer	343.467-018	933
473	Gambling Dealer	343.467-018	123

SATB No. or Study No.	DOT Title	DOT Code	Number of Subjects
474	Customer-Service Representative	239.367-010	278
1001	Central-Supply Worker	381.687-010	431
1002	Data Typist	203.582-022	174
1003	Etched-Circuit Processor	590.684-018	258
1004	Cytotechnologist	078.281-010	131
1005	Assembler	723.684-010	91
1006	Machine Operator II	619.685-062	247
1007	Supervisor	529.137-026	75
1008	Power-Reactor Operator	952.362-022	329
1010	Meter Reader	209.567-010	286
1011	Packager, Hand	920.587-018	203
1012	Environmental-Control-System-Installer-Servicer	637.261-014	262
3048	Pipe Fitter	862.261-010	95